UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/519,696 | 02/28/2005 | Lothar Dunsch | F-8521 | 7489 |

28107 7590 11/18/2008

JORDAN AND HAMBURG LLP
122 EAST 42ND STREET
SUITE 4000
NEW YORK, NY 10168

| EXAMINER | |
|---|---|
| SMITH, JENNIFER A | |
| ART UNIT | PAPER NUMBER |
| 1793 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 11/18/2008 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/519,696 | DUNSCH ET AL. | |
| | Examiner | Art Unit | |
| | JENNIFER A. SMITH | 1793 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *04 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/5/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Status of Application*

Claims 1-4, 7-10, and 12-14 have been amended.

Claims 17-24 are new.

Claims 1-24 are pending and are presented for examination.

### *Withdrawal of Claim Rejections - 35 USC § 112, 1st Paragraph (New Matter)*

The rejection of claims 12-13 and 15 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement are withdrawn in view of Applicant's amendments.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraph of 35 U.S.C. 102 that forms the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1-8 and 14-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Dorn et al. (US 6,303,760 B1).**

In the instant case, claim 1 is drawn to a method for synthesizing endohedral fullerenes in an arc reactor comprising:

- burning off graphite electrodes

- in an atmosphere which contains a reactive gas component

and providing said reactive gas component:

- with at least two elements in an inert gas or inert gas mixture.

The *description of the preferred embodiments* of Dorn et al. (US '760 hereafter) teaches a method for making metallofullernes using a Kratschmer-Huffman generator (arc reactor) [*column 4, lines 65-66*]:

- a potential is applied across graphite electrodes [*column 5, lines 59-60*]

- helium is introduced into the reaction chamber along with a small amount of nitrogen gas. [*column 5, lines 41-42*]. Here nitrogen-containing gas is the reactive component.

In regard to the amended features of claim 1, the *description of the preferred embodiments* of Dorn et al. (US '760 hereafter) teaches a method for making metallofullernes using a Kratschmer-Huffman generator (arc reactor) [*column 4, lines 65-66*]:

- a potential is applied across graphite electrodes [*column 5, lines 59-60*]

- helium is introduced into the reaction chamber along with a small amount of nitrogen gas (gaseous atmosphere). [*column 5, lines 41-42*]

- here nitrogen is the reactive component

In the instant case, claims 2, 3 are drawn to the method of claim 1 wherein the atmosphere includes 5% by volume to 60% by volume of reactive gas component, or more specifically 5% to 10%.

US '760 teaches the method in which the dynamic atmosphere ranges from about 300 ml/min to 1250 ml/min helium and about 20 ml/min to about 300 ml/min nitrogen gas. [*column 5, lines 43-45*]. With nitrogen as the reactive gas component and helium as the inert gas, this specification encompasses the range of 1.6% to 100% by volume and anticipates claims 2 and 3 of the instant application.

In the instant case, claim 4 is drawn to the method of claim 1 wherein the atmosphere includes a nitrogen-containing or carbon-containing reactive gas component.

US '760 teaches the method in which the source of nitrogen is preferably a nitrogen containing gas. [*column 5, lines 54-55*]

In the instant case, claim 5 is drawn to the method of claim 1 where the reactive gas component includes ammonia or methane or other hydrocarbons.

US '760 teaches the method in which the source of nitrogen in the process is preferably a nitrogen containing gas. [*column 5, lines 54-55*] Because methane is a nitrogen containing gas, claim 6 is anticipated by US '760.

In the instant case, claim 6 is drawn to the method of claim 1 where the reactive gas component is supplied to the arc reactor from outside during the burning off or is generated in the arc reactor.

US '760 teaches the introduction of helium along with a small amount of nitrogen gas into the evacuated reaction chamber. [*column 5, lines 41-42*] The packed graphite rod was vaporized in a dynamic helium atmosphere containing a small amount of nitrogen gas. [*column 8, lines 59-61*]

In regard to amended claims 7 and 8, US '760 teaches the graphite rods are typically cored and filled with a mixture of metal oxide and graphite. [*column 5, lines 10-11*]. US '760 teaches preferably the metal oxide is a rare earth metal or a group IIIB metal. Metal oxides may include, but are not limited to $Ho_2O_3$, etc. [*column 5, lines 12-15*]

In regard to claims 14-16, US '760 teaches the typical approach for producing fullerenes which involves producing an arc discharge in an inert gas which forms a carbon plasma (gas) in which fullerenes are produced [See Column 1, lines 21-31].

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dorn et al. (US '760).**

In regard to claim 9, US '760 teaches the process of as evidenced in the 102(b) rejection of claim 1. The instant claim differs from US '760 because US '760 fails to teach a nitrogen-containing substance along with metal or metal oxides in the graphite electrodes.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify US '760's teaching because US '760 teaches a method for making an endohedral metallofullerene comprising charging a reactor with a first metal, carbon, and nitrogen; and reacting the nitrogen, the first metal, and the carbon in the

reactor to form an endohedral metallofullerene. [*Dorn et al. Claim 16*] The nitrogen component is preferably a gas but modifying the graphite electrode with a nitrogen substance, as evidenced in claim 27 where the nitrogen of claim 16 is carbon nitride or metal nitrides containing the 'first metal' of claim 16, is also possible.

One would have been motivated to make such modification because it is well known in the art that nitrogen is an essential starting material for the process of making endohedral fullerenes. The phase of the nitrogen is the only modification and one would expect similar results as those in the process using gas phase nitrogen. The industrial applicability would have been greatly increased by such modification and one would have been expected reasonable success because the modification is considered well within the level (capability) of the ordinary skill in the art. Therefore, the claim 9 is obvious and not patentably distinct over the prior art of the record.

**Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dorn et al. (US '760) in view of Cain et al. (US Patent No. 6,787,794 B2).**

US '760 teaches steps of the method claimed in claim 10 but fails to teach modifying the graphite electrodes with a metal cyanamide.

Cain et al. (US '794, hereafter) teaches a fullerene in Figure 2. US '794 teaches an ammonia molecule [15] is anchored inside the fullerene [16]. Fullerene molecules

are formed in an ammonia atmosphere using graphite electrodes [See Column 11, lines 30-36]. Other molecules which have pyramidal structure such as cyanamide can be used as an alternative to the ammonia molecule.

One would have been motivated to include cyanamide-modified graphite electrodes in the process taught in US '760 because US '794 teaches the use of a pyramidal cyanamide molecule encased in an endohedral molecule. Such an arrangement produced by the processes disclosed in both references can be used as an improved quantum computer [See Column 3, lines 4-7 and 15-20].

**Claims 12 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dorn et al. (US '760) in view of Smalley (US Patent No. 5,330,203).**

In regard to amended claims 12, the Dorn et al. reference fails to teach ammonia as the reactive gas component.

Smalley et al. teaches adding an ammonia compound during fullerene condensation [See Column 7, line 23].

One of skill in the art would have been motivated, at the time of Applicant's invention, to use ammonia as the reactive component because ammonia acts as the protecting agent by donating electrons [See Column 7, lines 14-24].

In regard to claims 23-24, one of skill in the art would be able to modify the percent of gaseous components in the process through prior art conditions and "generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical." See MPEP 2144.05 II.

**Claims 13, 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dorn et al. (US '760) in view of Miley et al. (US Patent No. 6,171,451).**

In regard to amended claims 13 and 17-20, Dorn et al. fails to teach the hydrocarbon material (methane).

Miley et al. teaches a method of fullerene production which involves the injection of a carbon-based gas with a buffer gas into an IEC operating in either a continuous or pulsed mode. During the pulse, a dense, energetic, non-thermal plasma is formed, disassociating the methane into carbon and hydrogen [See Column 5, lines 6-11].

One of skill in the art, at the time of Applicant's invention, would be motivated to use a hydrocarbon gas as the reactive component in the process because the configuration taught in the Miley reference offers a very efficient way to form the desired plasma, which is non-Maxwellian in form such that the energetic ion component serves to effectively decompose the methane (or other carbon-containing gas feed). The potential field configuration in the core plasma region of the IEC is such that the higher Z carbon ions are preferentially concentrated in the core region of the plasma, while the hydrogen is moved towards the outer edge of the core [See Column 5, lines 11-20].

In regard to claims 21-22, one of skill in the art would be able to modify the percent of gaseous components in the process through prior art conditions and "generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical." See MPEP 2144.05 II.

***Response to Arguments***

Applicant's arguments filed on 08/04/2008 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., **higher yields**) are not recited in the rejected claim(s). Although the claims are

interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues the nitrogen gas disclosed in Dorn et al. is not a reactive gas. The reference teaches a nitrogen source is preferably a nitrogen containing gas, but may include other nitrogen sources including but not limited to carbon nitrides and metal nitrides [See Column 5, lines 54-58]. These nitrogen containing gases are reactive.

Applicant argues that claim 1 contains subject matter which has been adequately described in the specification (specifically the examples) in such a way as to enable one skilled in the art to make and/or use the invention because one would be able to determine, without undo experimentation, whether a particular component is reactive or not. The examiner has withdrawn the rejection of claim 1 under 35 U.S.C. 112, first paragraph in view of applicant's remarks.

Applicant argues, in regard to claim 5, Dorn et al. fails to disclose limiting the reactive gas component to ammonia, methane or other hydrocarbons. Dorn et al. is not limiting with regards to the nitrogen source and discloses the source of nitrogen is preferably a nitrogen containing gas but may include other nitrogen sources [See Column 5, lines 54-57]. These include, but are not limited to metal nitrides or carbon nitrides. Ammonia is a nitride compound.

Third, Applicant argues claims 12 and 13 distinguish over the prior art. These arguments are moot in view of Applicant's amendments to the claims.

Forth, Applicant argues one of ordinary skill in the art would have no reason to combine the teachings of Dorn et al. and Cain et al. Applicant argues Dorn et al. and Cain et al. disclose different kinds of fullerenes. In response to applicant's argument that Cain et al. is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). One would have been motivated to include cyanamide-modified graphite electrodes in the process taught in Dorn et al. because Cain et al. teaches the use of a pyramidal cyanamide molecule encased in an endohedral molecule. Such an arrangement produced by the processes disclosed in both references has improved electronic characteristics [See Cain et al.Column 3, lines 4-7 and 15-20].

***Conclusion***

Claims 1-24 are rejected.

No claims are allowed.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER A. SMITH whose telephone number is (571)270-3599. The examiner can normally be reached on Monday - Friday, 8:30am to 5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571)272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J.A. LORENGO/
Supervisory Patent Examiner, Art Unit 1793

Jennifer A. Smith
November 2, 2008
Art Unit 1793

JS